REMARKS

Claim Rejections - 35 U.S.C. 112

The claims have been substantially rewritten and have been cast in the form of process claims. It is believed that the claims are in statutory form and are not now subject to rejection under 35 U.S.C. 112.

Claim Rejections - 35 U.S.C. §102

Claims 1-4 were rejected under 35 U.S.C. 102(b) as being anticipated by Banthia et al. U.S. Patent 5,981,630. Banthia discloses a concrete formulation including reinforcing fibers. Applicant is not concerned with such a concrete formulation. Applicant's invention is a process relation to the design of concrete roadways using conventional mixes of concrete. No reinforcing materials are involved. It is believed that the recast claims will make it clear that Banthia et al. is not anticipatory of applicant's claims.

Claims 1-4 were also rejected under 35 U.S.C. §102(b) as anticipated by Bache U.S. Patent 4,978,992. Bache is concerned with "a lightweight reinforced concrete material". Again, applicant's invention involves a process using conventional mixes of concrete, not reinforced concrete. It is believed that Bache is not anticipatory of applicant's invention.

With respect to claims 5, 6, and 7, note that the three values of the MR appear in Table 2 on page 38 of applicant's specification. These claims are like claims 2, 3, and 4

but recast as process claims and are believed allowable along with claim 1.

The prior art made of record and not relied upon has been reviewed with interest, but none of the cited patents are believed anticipatory of applicant's claims.

It is understood that the Examiner has been supplied with Portland Cement Association Engineering Bulletin EB109P referred to in the claims.

To assist the Examiner, applicant has enclosed as an Appendix to the present paper, a brief summary entitled CONCRETE PAVEMENT WITH THE PRESET STRENGTH SAFETY LEVEL FOR HIGHWAYS AND STREETS.

It is believed that the claims are in condition for allowance and favorable action is requested. A Power of Attorney to the undersigned is enclosed.

Respectfully submitted,

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I:\Patent\Sapozhnikov\01.AMENDMENT A

CONCRETE PAVEMENT WITH THE PRESET STRENGTH SAFETY LEVEL FOR HIGHWAYS AND STREETS

The sense of present invention is more complete utilization of flexural strength of concrete considered as a random value for thickness design of concrete pavement than that provided by Portland Cement Association design procedure. Strength of any structural material should be considered as a random value, Consumption of material of this structural member is determined by the value of design strength of this material directly or indirectly. The degree of utilization of strength of this material in the process of design of any structural member is determined by the safety of design strength of this material. Thus, the optimal use of any structural material requires

a, Results of research of statistical characteristics of strength of this material

b. The choice of safety of design strength of material depending on the requirements to strength safety of structural member designed with the use of this material.

It completely relates to flexural strength of concrete as applied to thickness design of concrete pavement.

Statistical characteristics of flexural strength of concrete were obtained by processing data of 3,650 series of American test results of compressive and flexural strength of standard cylinders and beams, and 1,107 series of American and small

portion British test results of compressive and flexural strength of modified cubes and standard beams of normal concrete. These test results were used for the analysis of connections between the compressive and flexural strength of concrete, and these connections can be considered statistically significant. It allows estimation of mean value of flexural strength of concrete depending on the mean value of compressive strength of this concrete. According to Portland Cement Association Engineering Bulletin EB109 modulus of rupture of concrete (MR) is estimated as a mean value of 28-day flexural strength of this concrete.

The main characteristic of compressive strength is 28-day specified compressive strength. Each value of specified compressive strength corresponds to certain mean value of compressive strength; according to American building code ACI 318 required average strength of concrete (mean value of this strength) is equal to fc' +1.34 (fc), where fc' is specified compressive concrete strength of concrete, (fc) is the mean deviation of this strength. Thus, value of modulus of rupture estimated according to said PCA Engineering Bulletin EB 109 can be considered just corresponding to the value of 28-day specified compressive strength of this concrete.

Design strength of concrete pavement is estimated as a part of modulus of rupture, and this part is defined as a stress ratio factor. Strength safety of concrete pavement is equivalent to the safety of design flexural strength as a probability **P(fr des < fr)**, flexural strength **fr** being considered as a random value. Strength safety of highway concrete pavements designed according to said Portland Cement Association

Engineering Bulletin EB 109 corresponds to strength safety of reinforced concrete columns of multistory building frame designed according to American building code ACI 318. More complete utilization of flexural strength of concrete means the thickness design of concrete with the use of values of modulus of rupture exceeding mean value of flexural strength and corresponding increase of design strength of concrete. Possibility of increase of estimation of modulus of rupture of concrete of pavement of the certain stress ratio factor depends on the estimation of strength safety of pavement corresponding to this value of modulus of rupture; it should be not less than preset strength safety level required according to the invention.

The preset strength safety levels of pavement of highways and streets depending on the volume of truck traffic were chosen on the basis of analysis of the existing strength safety level of real structural members, since the practice is the only criterion of strength safety. The few considerable samplings of test results of underreinforced prestressed floor and roof slabs of multi-story building frames, mainly prestressed hollow-core slabs (more than 2,000 slabs) were used for the estimation of existing strength safety level of real structures. These slabs were designed according to the Russian building code, produced and tested at the Russian plants of precast concrete; Russian construction is based on the use of precast concrete, and the Russian building code requires regular tests of these structural members, mainly floor and roof slabs. Furthermore, the estimation of strength safety of these slabs was compared with the estimation of strength safety of columns, which is based on the test results of 111 axially loaded reinforced concrete columns of multi-story building frames produced on

the Moscow plants. To apply this data to the American building practice it is necessary to compare the strength design of the same underreinforced flexural members according to the American building code ACI 318 and the Russian building code.

The sufficiency of thickness of pavement corresponding to the increased values of modulus of rupture should be checked according to existing thickness design procedure. As a result of more complete utilization of flexural strength of concrete thickness of concrete pavement of highways and streets can be reduced by 8-10% as compared with that provided by current design procedure. In so doing pavement of reduced thickness corresponds to requirements of fatigue and erosion analysis of this design procedure, and strength safety of this pavement can be considered sufficient.

The High-Performance CONstruction MATerials and Systems (CONMAT) program is a ten-year, $2 billion national program of technological research, development, and deployment. One of its main goal is to make the **best use of existing national resources. More complete utilization of flexural strength of concrete as applied to thickness design of concrete pavements of highways and streets is in format of this program; considerable part of concrete is used for road construction.**

Thus, this invention relates to more complete utilization of flexural strength of pure normal concrete of concrete pavement of highway and street.

Production of concrete in USA constitutes hundreds millions of cubic meters per year, and considerable part of this concrete is used in the road construction. Flexural strength is the main characteristic of strength of this concrete, and more complete utilization of flexural strength of this material is important in terms of reduction of cost of road construction in the country.

Moreover, more complete utilization of flexural strength of concrete as applied to concrete pavements can increase the competitiveness of these pavements as compared with asphalt pavements. It means the replacement of part of asphalt by concrete with corresponding reduction of consumption of such petrol product as bitumen. Bitumen is by-product of refining of oil but this by-product can be processed to the high quality product. Reduction expenditure of bitumen can allow reduction of import of oil. Production of cement for concrete also required expenditure of energy resources. However US production of cement is based mainly on the use of American coal as a fuel.